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PATENT ABSTRACTS OF JAPAN

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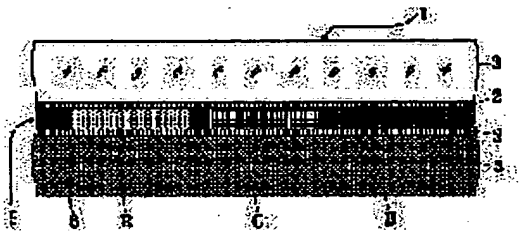
(72)Inventor : NAKAI YUICHI

(54) POLYMER DISTRIBUTED LIQUID CRYSTAL DISPLAY DEVICE AND MANUFACTURE OF THE SAME

(57)Abstract:
PURPOSE: To easily perform coating when forming a liquid crystal/polymer composite film and further to prevent air bubbles from being mixed by forming the liquid crystal/ polymer composite film inside plural sectioned chambers divided by partition walls and forming the partition walls from water repellent resin.
CONSTITUTION: This device is provided with transparent conductive films 2 and 2 to be operated as electrodes and a liquid crystal/polymer composite film 5, which distributedly holds liquid crystal in a high polymer matrix provided with pigments colorless, colored or preferably in the three primary colors of R (red), G (green) and B (blue), is sandwiched between a pair of glass or film substrates 3 and 3 for which one of them is transparent. Then, partition walls 6 composed of water repellent resin is formed at a gap between the areas of the liquid crystal/polymer composite film 5. Therefore, since an equeous emulsion liquid crystal layer to be applied in the chambers divided by the partition walls 6 is formed into the state of raising the surface, even when the volume of the emulsion is decreased by drying the liquid crystal emulsion, the height of the polymer/liquid crystal composite film 5 formed after drying is almost equal to the height of partition walls 6.



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* NOTICES * .

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CLAIMS

[Claim(s)]
[Claim 1] A polymer dispersed liquid crystal display characterized by being formed in two or more quality of a partition divided by septum by which the above-mentioned liquid crystal / macromolecule bipolar membrane were formed in a conductive substrate side between conductive substrates of a pair at least with transparent one side in a polymer dispersed liquid crystal display which comes to pinch liquid crystal / macromolecule bipolar membrane, and the above-mentioned septum consisting of water-repellent resin.
[Claim 2] A polymer dispersed liquid crystal display according to claim 1 which liquid crystal / macromolecule bipolar membrane is colored with dichroism coloring matter.
[Claim 3] A polymer dispersed liquid crystal display according to claim 2 currently colored with dichroism coloring matter of a hue with which liquid crystal differs from macromolecule bipolar membrane of an adjoining field for every quality of a partition.
[Claim 4] A polymer dispersed liquid crystal display according to claim 1 to 3 whose septum which consists of water-repellent resin is protection-from-light nature.
[Claim 5] A polymer dispersed liquid crystal display according to claim 1 to 4 with which one [at least] conductive substrate of the conductive substrates of a pair consists of a flexible film.
[Claim 6] A manufacture method of a polymer dispersed liquid crystal display characterized by having a production process which forms a septum which consists of water-repellent resin on a conductive substrate, a production process which fills up with and dries a liquid crystal emulsion, and forms liquid crystal / macromolecule bipolar membrane in a compartment divided by this septum, and a production process which sticks a conductive substrate on this liquid crystal / macromolecule bipolar membrane.
[Claim 7] A manufacture method of a polymer dispersed liquid crystal display according to claim 6 which distinguishes a liquid crystal emulsion of two or more colors by different color with for every compartment.
[Claim 8] A manufacture method of a polymer dispersed liquid crystal display according to claim 7 of performing a coating division of a liquid crystal emulsion using a metal mask.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the liquid crystal display which used liquid crystal / macromolecule bipolar membrane, and its manufacture method.
[0002]
[Description of the Prior Art] Conventionally, power consumption of a liquid crystal display is low, and it is widely used for a wrist watch, a calculator, a personal computer, television, etc. as an alphabetic character or display data medium of an image with the light weight, the thin shape, etc. The liquid crystal display of a common TN mold and a common STN mold consists of a configuration sandwiched with the polarizing plate from both sides further, after placing the liquid crystal cell to which the predetermined seal was given between the glass plates which have a transparent electrode and enclosing liquid crystal into this liquid crystal cell. this common liquid crystal display of TN mold and a STN mold -- (1) -- since two polarizing plates are required, an angle of visibility is narrow, and since (2) cel thickness dependency which needs the back light of high power consumption since brightness is insufficient is large, and (3) configurations with difficult large-area-izing are complicated, it is difficult in a liquid crystal cell to enclose liquid crystal, and a manufacturing cost becomes high -- it has the defect of **.
[0003] As what solves these troubles, the liquid crystal / macromolecule bipolar membrane which distributed liquid crystal in the macromolecule matrix are developed, and the emulsion method and the phase separation method are used as the manufacture method of of this liquid crystal / macromolecule bipolar membrane. In the manufacture method of of the liquid crystal / macromolecule bipolar membrane by the emulsion method How (****** No. 501631 [58 to] official report) to use the aqueous solution which made this emulsify liquid crystal for polyvinyl alcohol as protective colloid, There is a method (JP,60-252687,A) of using the aqueous solution which mixed the liquid crystal emulsion with the latex, and for the manufacture method of of the liquid crystal / macromolecule bipolar membrane by the phase separation method There are liquid crystal, a method to which the phase separation condition of matrix resin is made to fix, and the method of carrying out phase separation of the liquid crystal from matrix resin at the time of film formation.

[0004] There are a method (****** No. 502128 [61 to] official report) of stiffening as a method to which the phase separation condition of liquid crystal and matrix resin is made to fix, after distributing liquid crystal in an epoxy resin, and a method (****** No. 2231 [62 to] official report) of stiffening UV hardening mold resin, after distributing liquid crystal in UV hardening mold resin. Moreover, as the method of carrying out phase separation of the liquid crystal from matrix resin at the time of film formation, there are a method of carrying out phase separation of the liquid crystal during hardening of matrix resin, a method of carrying out phase separation of the liquid crystal during solvent evaporation, the method (****** No. 501512 [63 to] official report) of carrying out phase separation by the cooling process of thermoplastics, etc. As amelioration technology of the method of carrying out phase separation during hardening of matrix resin, there are a method (JP,63-271233,A, JP,1-252689,A) of carrying out phase separation of the liquid crystal during hardening of UV hardening resin of the mixed stock of liquid crystal and UV hardening resin, a method (JP,63-287820,A, JP,1-299022,A) of carrying out phase separation of the liquid crystal during hardening of the heat-curing mold epoxy resin of the mixed stock of liquid crystal and a heat-curing mold epoxy resin, etc.
[0005] Moreover, what uses as a matrix the acrylic resin which has an activity hydroxyl group as amelioration technology of the method of carrying out phase separation of the liquid crystal (JP,1-230693,A), the thing (provisional-publication-of-a-patent sum No. 124025 [63 to] official report) which uses cellulose acetate as a matrix, the thing (JP,63-43993,A) which uses liquid crystal and resin without compatibility as a matrix are during solvent evaporation. The thing using the above liquid crystal / macromolecule bipolar membrane becomes a bright liquid crystal display with

high efficiency for light utilization, and moreover, since it can manufacture using the applying method, the price of it may fall.

[0006]

[Problem(s) to be Solved by the Invention] However, it has the defect that the liquid crystal / macromolecule bipolar membrane of the engine performance which was excellent depending on the method of application are not obtained with the spreading fitness of the polymer dispersed liquid crystal solution itself not sufficient [the liquid crystal display using the above-mentioned liquid crystal / macromolecule bipolar membrane]. Moreover, in using the emulsion of the aqueous solution of water soluble polymer material, and liquid crystal, in order to raise electro-optics properties, such as a fall of driver voltage, and to perform sufficient emulsion-ization for coincidence by carrying out a liquid crystal content to 80 - 90% of the weight, and lessening a high polymer as much as possible, it is using the water of an amount two to 3 times. For this reason, thixotropicality becomes high and removal of the air bubbles mixed on the occasion of formation of a paint film becomes difficult.

[0007] In addition, in a liquid crystal display, existence of air bubbles is a fatal problem and it is difficult to remove the air bubbles mixed especially at the spreading production process. Therefore, the voltage characteristic required of a liquid crystal display cannot be equalized on the whole surface. Furthermore, also in manufacture of the liquid crystal / macromolecule bipolar membrane in a phase separation method, a macromolecule matrix must be lessened as much as possible, the fluidity of spreading liquid becomes high inevitably, and the completely same problem as the above occurs.

[0008] It faces forming liquid crystal / macromolecule bipolar membrane in this way, and various kinds of methods of application cannot be used effectively. For example, in a blade coating method, there is a problem which applies, and finally etc. applies at the edge of a paint film and the beginning of coating, and spots generate, and a pattern coat is impossible and there is a problem of using expensive spreading liquid too much. Moreover, in screen printing, problems, like spreading liquid makes it generating of the air bubbles in the time of passing a mesh and the rear face of a version the circumference of the reverse side occur. Therefore, the purpose of this invention can solve the defect of the above-mentioned conventional technology, can perform easily spreading at the time of forming liquid crystal / macromolecule bipolar membrane, and is to offer the polymer dispersed liquid crystal display by uniform liquid crystal / macromolecule bipolar membrane without mixing of air bubbles moreover.

[0009]

[Means for Solving the Problem] The above-mentioned purpose is attained by this invention by the following configurations. That is, this inventions are a polymer dispersed liquid crystal display characterized by being formed in two or more quality of a partition divided by septum by which the above-mentioned liquid crystal / macromolecule bipolar membrane were formed in a conductive substrate side between conductive substrates of a pair at least with transparent one side in a polymer dispersed liquid crystal display which comes to pinch liquid crystal / macromolecule bipolar membrane, and the above-mentioned septum consisting of water-repellent resin, and its manufacture method.

[0010]

[Function] According to above-mentioned this invention, the water liquid crystal emulsion layer applied by the water repellence of the septum which consists of water-repellent resin in the compartment by the septum Since it is formed after the surface has risen, even if the volume of an emulsion decreases by desiccation of a liquid crystal emulsion The thickness of the polymer liquid crystal bipolar membrane formed after desiccation becomes possible [making it almost the same as that of the height of a septum]. Therefore, in case a counterelectrode substrate is stuck and set, in order to contact electrically a counterelectrode substrate, and liquid crystal / macromolecule bipolar membrane, the production process which applies electric conduction material between a counterelectrode substrate, and liquid crystal / macromolecule bipolar membrane can be skipped.

[0011] Moreover, since the septum which consists of water-repellent resin is formed in the perimeter of the field which should form liquid crystal / macromolecule bipolar membrane, an expensive liquid crystal emulsion can be used only for a required portion. Furthermore, since the spreading production process of a liquid crystal emulsion is easy, a polymeric-materials substrate and a film substrate can be used as the polymer dispersed liquid crystal display used as a conductive substrate. Moreover, since the coloring for every field of the liquid crystal / macromolecule bipolar membrane divided and prepared in two or more fields is easy, it is easy to perform color specification of arbitration, and it can supply cheaply the reflective mold color display panel which could not be expressed in conventional TN mold and a conventional STN mold.

[0012]

[Best Mode of Carrying Out the Invention] Next, a desirable embodiment is mentioned and this invention is explained still more concretely. One example of the configuration of the polymer dispersed liquid crystal display of this invention

is shown in drawing 1 . The polymer dispersed liquid crystal display 1 of this invention has the transparence electric conduction films 2 and 2 which carry out an operation of an electrode, and at least one side among the substrates 3 and 3, such as one pair of transparent glass, or a film Into the macromolecule matrix containing colorlessness, coloring, or the desirable coloring matter of R (red), G (green), and B (blue) in three primary colors, the liquid crystal / macromolecule bipolar membrane 5 by which distributed maintenance of the liquid crystal is carried out are pinched, and the septum 6 which becomes the gap of the fields of this liquid crystal / macromolecule bipolar membrane 5 from water-repellent resin is formed. When the macromolecule is colored, it is desirable that the dichroism coloring matter which absorbs the light which the coloring matter contained in a matrix in a liquid crystal particle does not absorb is added. Moreover, the liquid crystal particle may be encapsulated.

[0013] In order that the dichroism coloring matter in the liquid crystal in this case may change the direction of a molecule with alignment of the liquid crystal molecule by electric field, the light absorption property of each pixel changes with impression and no impressing. [of voltage] In the condition that absorption of dichroism coloring matter is sufficiently low, the pixel shows the color by the coloring matter in a matrix, and the pixel shows black with the color mixture of dichroism coloring matter and the coloring matter in a matrix in the condition that absorption of dichroism coloring matter is sufficiently high. Since the contrast of the image displayed is made to fall, if possible, it must avoid that the dichroism coloring matter in liquid crystal colors to a matrix layer. For this reason, as for a liquid crystal particle, being encapsulated is desirable. The dichroism coloring matter in liquid crystal can use a different thing for every liquid crystal / macromolecule bipolar membrane of each field for the purpose of improvement in a chromaticity property, improvement in efficiency for light utilization, improvement in contrast, etc. It is arranged with regular patterns, such as the shape of the shape of a stripe, or a mosaic, the electrode corresponding to each is prepared in these fields, and turning on and off of the voltage impression to every pixel is possible for the liquid crystal / macromolecule bipolar membrane which makes each above field. Behind liquid crystal / macromolecule bipolar membrane, a diffuse reflection board is formed, and in order to obtain sufficient brightness, the source of the white light may be prepared back.

[0014] Next, the manufacture method of the polymer dispersed liquid crystal display of this invention is explained based on process drawing by drawing 2 . In the 1st production process, the pattern of the detachability resin layer 7 is prepared with screen printing on the transparence electric conduction film [in / like / one substrate 3] 2 shown in drawing 2 a. The thickness of the detachability resin layer 7 at this time determines that height suitably in consideration of the volume decrease when applying and drying the thickness and the liquid crystal emulsion of a septum 6 which consist of the below-mentioned water-repellent resin formed in Mizouchi of detachability resin layer 7 these etc. In addition, the transparence electric conduction film 2 of the surface of a substrate 3 is for example, an ITO film etc., and a glass plate, a quartz board, the board made of various kinds of synthetic resin, a film, etc. can be used for it as a substrate 3.

[0015] In the 2nd continuing production process, the septum 6 which consists of water-repellent resin is formed by filling up the gap between the patterns of the detachability resin layer 7, i.e., Mizouchi, with water-repellent resin liquid using the squeegee by a flexible metal, hard rubber, etc. shown in drawing 2 b, and stiffening this like. The septum 6 which consists of this water-repellent resin is formed by silicon resin or fluorine system resin. Moreover, the polymer dispersed liquid crystal display excellent in color reproduction nature and contrast is obtained by forming the septum 6 which consists of this water-repellent resin by the resin of light impermeability nature, or carrying out adding the material of light impermeability nature in the septum 6 which consists of water-repellent resin etc., and considering as the resin layer of protection-from-light nature.

[0016] In the 3rd production process, the compartment 8 of the septum 6 which exfoliates the above-mentioned detachability resin layer 7 like using a pincette or adhesive tape, and consists of water-repellent resin and the meantime which are shown in drawing 2 c is formed. Furthermore, in the 4th production process, like, into the compartment by the septum 6 which is shown in drawing 2 d and which consists of water-repellent resin, after pouring out calmly the liquid crystal emulsion 9 which fully removed air bubbles, flattening of the surface of the liquid crystal emulsion 9 is carried out using the squeegee 10 by a flexible metal, hard rubber, etc. Of the synergistic effect of the water repellence of this time gap wall, and the surface tension of a liquid crystal emulsion, a center rises and the liquid crystal emulsion layer 9 is formed. In the 5th production process, by drying at the temperature which does not affect a room temperature or the liquid crystal emulsion 9, like, although volume is decreasing as a liquid crystal emulsion, the liquid crystal / macromolecule bipolar membrane 5 of the condition by which it is shown in drawing 2 e and in which the surface center section rose as liquid crystal / macromolecule bipolar membrane are obtained.

[0017] In the 6th production process of an after an appropriate time, the conductive substrate 3 of another side which has the transparence electric conduction film 2 is stuck on liquid crystal / macromolecule bipolar membrane 5, it sticks, and the polymer dispersed liquid crystal display 1 by the configuration shown in drawing 1 is obtained. As for the height

of the septum which consists of water-repellent resin in the polymer dispersed liquid crystal display of this invention, it is desirable to make it almost equal to the thickness of the liquid crystal / macromolecule bipolar membrane formed after desiccation. In the case of formation of liquid crystal / macromolecule bipolar membrane, it is suitable to use the liquid crystal which microencapsulated from the point of rationalization of the voltage allocation to the paint film structure, and liquid crystal and a matrix of the liquid crystal / macromolecule bipolar membrane obtained, and to use the emulsion spreading liquid which carried out emulsification distribution of this into the aqueous solution of water soluble resin.

[0018] The general microencapsulation technology applied to other materials can be used for the method of microencapsulating liquid crystal. There are the chemical producing method, the physicochemical producing method, and the physical / mechanical producing method as general microencapsulating method. It is the interfacial polymerization and in which use a synthetic reaction about the chemical producing method. There are a situ polymerization method and hardening-among liquid coating which produces high-polymer nature change. Interfacial polymerization is the method of choosing a water-soluble thing and an oil solubility thing as a polycondensation or two sorts of monomers which carry out a polyaddition reaction, making distribute either, and making it react by the interface. in A situ polymerization method is the method of supplying reactant (a monomer, initiator) from outer one side among karyomitome, and making it react on the capsule wall membrane surface. Hardening-among liquid coating (the orifice method) is the method of hardening the wall membrane in sclerosing solution, after encapsulating karyomitome by the wall membrane agent beforehand.

[0019] As a physicochemical producing method, there are the coacervation method, interface settling (the condensing-in liquid method, the liquid drying, the secondary emulsion method), and fusion variational method using phase separation. Furthermore, an aqueous solution system or an organic solvent system can also use the coacervation method. Moreover, the simple coacervation method for producing phase separation by soluble reduction and the compound coacervation method for producing phase separation by the electric interaction can be used. By the organic solvent system, the phase separation phenomenon by change of solubility, temperature, etc. is used.

[0020] After interface settling distributes the emulsion by which neither an intense reaction nor rapid pH change is accompanied and which is the method of encapsulating on mild conditions, for example, distributed liquid crystal karyomitome in the solvent solution of a hydrophobic macromolecule, a protective colloid solution is made to distribute it further. A fusion variational method is the method of cooling using wax-like material like a wax or polyethylene as wall membrane material, after distributing karyomitome in liquid with wax-like material under heating. Although a spray drying process, suspension coating in mind, vacuum deposition coating, etc. are mentioned as the physical / mechanical production method, the liquid crystal which is karyomitome is a liquid in ordinary temperature, and since production of an emulsion which prepares the magnitude will be the requisite, it is not suitable as a capsule producing method of liquid crystal.

[0021]

[Example] Next, an example is given and this invention is explained still more concretely.

After applying a solder masking reagent (the Sannopuko make, TC-580-SN) to the ITO side of a glass plate with example 1ITO (100mmx100mmx1.1mm) in the shape of a pattern with screen printing, at 170 degrees C, it heats to it for 10 minutes, it was stiffened, and the pattern-like detachability resin layer was formed in it. The septum which consists of water-repellent resin was formed by using silicon resin (the Shin-Etsu Chemical Co., Ltd. make, RC-720), being filled up with the squeegee for screen-stencil in the crevice which is the gap of the detachability resin layers of the shape of an acquired pattern, irradiating an electron ray and stiffening it further. Subsequently, the pattern-like detachability resin layer was exfoliated with the pincettes, and the compartment divided by the septum which consists of water-repellent resin was formed.

[0022] In the compartment which consists of obtained water-repellent resin, after filling up with the squeegee for screen-stencil the liquid crystal emulsion which made the polyvinyl alcohol aqueous solution distribute a nematic liquid crystal (the Merck Co. make, E-44), it dried with the dryer and liquid crystal / macromolecule bipolar membrane was formed. The target polymer dispersed liquid crystal display was obtained by making after an appropriate time stick the ITO side of the glass plate with ITO which forms the conductive substrate of another side on said liquid crystal / macromolecule bipolar membrane, and sticking on it. If the obtained liquid crystal display did not impress voltage, it was white opacity, but when voltage was impressed, it became transparent and colorless.

[0023] After applying a solder masking reagent (the product made from Sannopuko , TC-580-SN) to the ITO side of a glass plate with example 2ITO (100mmx100mmx1.1mm) in the shape of a pattern with screen printing, at 170 degrees C, it heats to it for 10 minutes, it was stiffened, and the pattern-like detachability resin layer was formed in it. The septum which consists of water-repellent resin was formed by using silicon resin (the product made from Shin-Etsu

Chemical , RC-720), being filled up with the squeegee for screen-stencil in the crevice which is the gap of the detachability resin layers of the shape of an acquired pattern, irradiating an electron ray and stiffening it further. Subsequently, the pattern-like detachability resin layer was exfoliated with the pincettes, and the compartment divided by the septum which consists of water-repellent resin was formed.

[0024] In the compartment which consists of obtained water-repellent resin, after filling up with the squeegee for screen-stencil the liquid crystal emulsion which made the polyvinyl alcohol aqueous solution distribute the nematic liquid crystal (the Merck Co. make, E-44) in which dichroism coloring matter (made in Japan sensitizing dye research institute, G-264) was dissolved, it dried with the dryer and liquid crystal / macromolecule bipolar membrane was formed. The target polymer dispersed liquid crystal display was obtained by making after an appropriate time stick the ITO side of the glass plate with ITO which forms the conductive substrate of another side on said liquid crystal / macromolecule bipolar membrane, and sticking on it. If the obtained liquid crystal display did not impress voltage, it was blue opacity, but when voltage was impressed, it became transparent and colorless.

[0025] After applying a solder masking reagent (the Sannopuko make, TC-580-SN) to the ITO side of a glass plate with example 3ITO (100mmx100mmx1.1mm) in the shape of a pattern with screen printing, at 170 degrees C, it heats to it for 10 minutes, it was stiffened, and the pattern-like detachability resin layer was formed in it. The septum which consists of water-repellent resin was formed by using silicon resin (the Shin-Etsu Chemical Co., Ltd. make, RC-720), being filled up with the squeegee for screen-stencil in the crevice which is the gap of the detachability resin layers of the shape of an acquired pattern, irradiating an electron ray and stiffening it further. Subsequently, the pattern-like detachability resin layer was exfoliated with the pincettes, and the compartment divided by the septum which consists of water-repellent resin was formed.

[0026] In the compartment which consists of obtained water-repellent resin, after pouring out the liquid crystal emulsion which made the polyvinyl alcohol aqueous solution distribute the nematic liquid crystal (the Merck Co. make, E-44) in which dichroism coloring matter (M-137, Mitsui Toatsu Dye Co., Ltd. make) was dissolved from from [after piling up a metal mask] and filling it up with the squeegee for screen-stencil, it dried with the dryer and liquid crystal / macromolecule bipolar membrane was formed. The emulsion in which dichroism coloring matter (M-421, Mitsui Toatsu Dye Co., Ltd. make) was dissolved similarly was similarly coated from the metal mask of another pattern. The emulsion in which dichroism coloring matter (SI-426, Mitsui Toatsu Dye Co., Ltd. make) was dissolved further was similarly coated from the metal mask of another pattern after desiccation. It was made to dry at a room temperature after that one whole day and night.

[0027] The target polymer dispersed liquid crystal display was obtained by making after an appropriate time stick the ITO side of the glass plate with ITO which forms the conductive substrate of another side on said liquid crystal / macromolecule bipolar membrane, and sticking on it. If the obtained liquid crystal display did not impress voltage, although it was in red, blue, and the opaque condition colored green, when voltage was impressed for every pattern, it changed into the transparent and colorless condition. Moreover, when it chose impression and no impressing for every pattern, the pattern of various love scenes has been displayed. [of voltage]

[0028] After applying a solder masking reagent (the Sannopuko make, TC-580-SN) to the ITO side of the PET film which vapor-deposited example 4ITO in the shape of a pattern with screen printing, at 120 degrees C, it heats to it for 60 minutes, it was stiffened, and the pattern-like detachability resin layer was formed in it. The septum which consists of water-repellent resin was formed by using silicon resin (the Shin-Etsu Chemical Co., Ltd. make, RC-720), being filled up with the squeegee for screen-stencil in the crevice which is the gap of the detachability resin layers of the shape of an acquired pattern, irradiating an electron ray and stiffening it further. Subsequently, the pattern-like detachability resin layer was exfoliated with the pincettes, and the compartment divided by the septum which consists of water-repellent resin was formed.

[0029] In the compartment which consists of obtained water-repellent resin, after filling up with the squeegee for screen-stencil the liquid crystal emulsion which made the polyvinyl alcohol aqueous solution distribute a nematic liquid crystal (the Merck Co. make, E-44), it dried with the dryer and liquid crystal / macromolecule bipolar membrane was formed. The target polymer dispersed liquid crystal display was obtained by making after an appropriate time stick the ITO side of the PET film which vapor-deposited ITO which makes the conductive substrate of another side on said liquid crystal / macromolecule bipolar membrane, and sticking on it. If the obtained liquid crystal display did not impress voltage, it was white opacity, but when voltage was impressed, it became transparent and colorless. since [moreover,] a conductive substrate is [both] films -- the equipment whole -- it can bend -- a boiled-fish-paste mold -- even if cylindrical, it was able to display.

[0030]

[Effect of the Invention] According to above-mentioned this invention, it can apply also to the display which needs high

degree of accuracy like the display of the mass monochrome of the display of a personal computer or a word processor, and others, or the active-matrix mold of a color not to mention the static mold display which performs an easy alphabetic character and an easy pattern display, and the thing of the display of a large area can also be manufactured, and it can use for a wide range field.
[0031]

[Translation done.]

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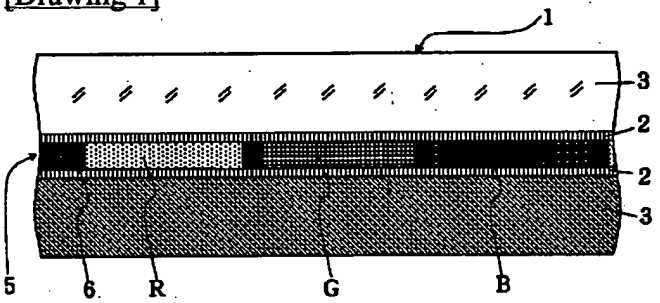
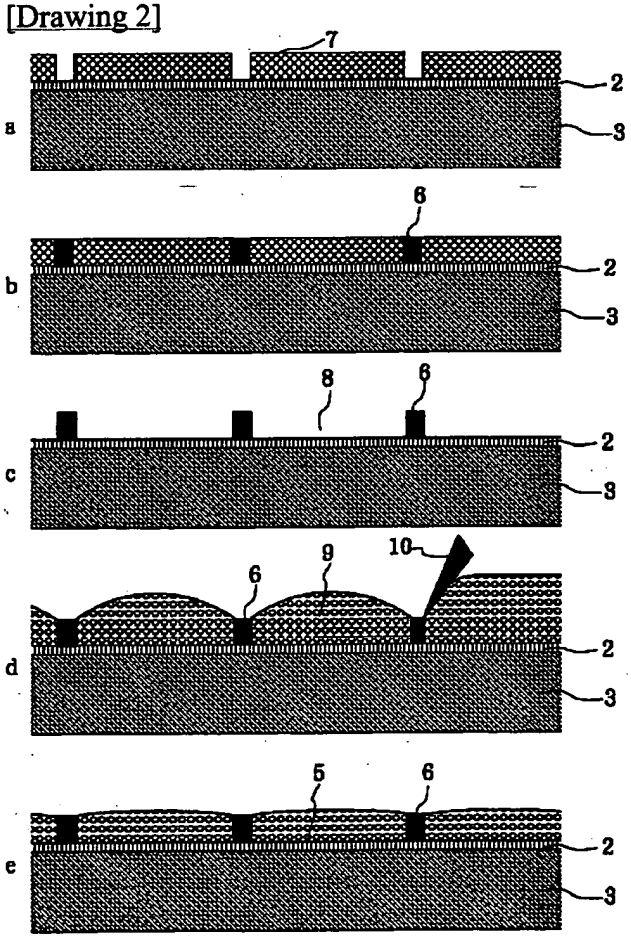
DRAWINGS

[Drawing 1]



[Drawing 2]



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EUROPEAN PATENT OFFICE

Patent Abstracts of Japan

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APPLICANT : DAINIPPON PRINTING CO LTD;

INVENTOR : NAKAI YUICHI;

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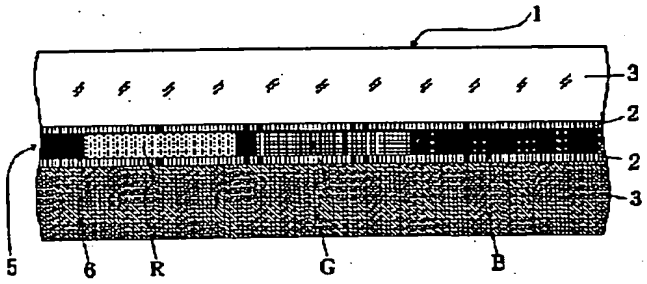
TITLE : POLYMER DISTRIBUTED LIQUID CRYSTAL DISPLAY DEVICE AND MANUFACTURE OF THE SAME



ABSTRACT : PURPOSE: To easily perform coating when forming a liquid crystal/polymer composite film and further to prevent air bubbles from being mixed by forming the liquid crystal/polymer composite film inside plural sectioned chambers divided by partition walls and forming the partition walls from water repellent resin.

CONSTITUTION: This device is provided with transparent conductive films 2 and 2 to be operated as electrodes and a liquid crystal/polymer composite film 5, which distributedly holds liquid crystal in a high polymer matrix provided with pigments colorless, colored or preferably in the three primary colors of R (red), G (green) and B (blue), is sandwiched between a pair of glass or film substrates 3 and 3 for which one of them is transparent. Then, partition walls 6 composed of water repellent resin is formed at a gap between the areas of the liquid crystal/polymer composite film 5. Therefore, since an equeous emulsion liquid crystal layer to be applied in the chambers divided by the partition walls 6 is formed into the state of raising the surface, even when the volume of the emulsion is decreased by drying the liquid crystal emulsion, the height of the polymer/liquid crystal composite film 5 formed after drying is almost equal to the height of partition walls 6.

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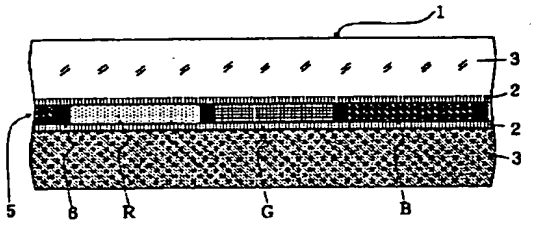
(54)【発明の名称】　高分子分散型液晶表示装置及びその製造方法

(57)【要約】

【目的】　従来技術の欠点を解決し、液晶／高分子複合膜を形成する際の塗布を容易に行なうことが出来、しかも、気泡の混入のない均一な液晶／高分子複合膜による高分子分散型液晶表示装置を提供すること。

【構成】　少なくとも一方が透明な一対の導電性基板間に、液晶／高分子複合膜を挟持してなる高分子分散型液晶表示装置において、上記液晶／高分子複合膜が導電性基板面に形成された隔壁によって区画された複数の区画質内に形成され、且つ上記隔壁が撥水性樹脂からなることを特徴とする高分子分散型液晶表示装置、及びその製造方法。



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【特許請求の範囲】

【請求項1】　少なくとも一方が透明な一対の導電性基板間に、液晶／高分子複合膜を挟持してなる高分子分散型液晶表示装置において、上記液晶／高分子複合膜が導電性基板面に形成された隔壁によって区画された複数の区画質内に形成され、且つ上記隔壁が撥水性樹脂からなることを特徴とする高分子分散型液晶表示装置。

【請求項2】　液晶／高分子複合膜が二色性色素によって着色されている請求項1に記載の高分子分散型液晶表示装置。

【請求項3】　隣接する領域の液晶／高分子複合膜が各区画質毎に異なる色相の二色性色素によって着色されている請求項2に記載の高分子分散型液晶表示装置。

【請求項4】　撥水性樹脂からなる隔壁が遮光性である請求項1～3に記載の高分子分散型液晶表示装置。

【請求項5】　一対の導電性基板のうちの少なくとも一方の導電性基板が柔軟なフイルムからなる請求項1～4のいずれかに記載の高分子分散型液晶表示装置。

【請求項6】　導電性基板上に撥水性樹脂からなる隔壁を形成する工程と、該隔壁によって区画された区画室内に、液晶エマルジョンを充填及び乾燥して液晶／高分子複合膜を形成する工程と、該液晶／高分子複合膜の上に導電性基板を貼着する工程とを有することを特徴とする高分子分散型液晶表示装置の製造方法。

【請求項7】　複数色の液晶エマルジョンを、各区画室毎に塗り分ける請求項6に記載の高分子分散型液晶表示装置の製造方法。

【請求項8】　液晶エマルジョンの塗り分けを、メタルマスクを利用して行う請求項7に記載の高分子分散型液晶表示装置の製造方法。

【発明の詳細な説明】

【0001】

【産業上の利用分野】本発明は液晶／高分子複合膜を用いた液晶表示装置及びその製造方法に関する。

【0002】

【従来の技術】従来、液晶表示装置は、消費電力が低く、軽量、薄型等により、文字や画像の表示媒体として、例えば、腕時計、電卓、パソコン、テレビ等に広く利用されている。一般的なＴＮ型及びＳＴＮ型の液晶表示装置は、透明電極を有するガラス板間に所定のシールが施された液晶セルを置き、該液晶セル中に液晶を封入した上で、更に両面から偏光板でサンドイッチした構成からなっている。この一般的なＴＮ型及びＳＴＮ型の液晶表示装置は、（1）二枚の偏光板が必要な為に視野角が狭く、又、輝度が不足している為に高消費電力のバックライトを必要とする、（2）セル厚依存性が大きい為、大面積化が困難である、（3）構成が複雑な為液晶セル中に液晶を封入するのが困難であり、製造コストが高くなる、等の欠点を有している。

【0003】これらの問題点を解決するものとして、液

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晶を高分子マトリックス中に分散させた液晶／高分子複合膜が開発され、かかる液晶／高分子複合膜の製造方法としてエマルジョン法と相分離法とが用いられている。エマルジョン法による液晶／高分子複合膜の製造方法には、ポリビニルアルコールを保護コロイドとしてこれに液晶を乳化させた水溶液を利用する方法（特表昭５８－５０１６３１号公報）と、液晶エマルジョンをラテックスと混合した水溶液を利用する方法（特開昭６０－２５２６８７号公報）とがあり、又、相分離法による液晶／高分子複合膜の製造方法には、液晶とマトリックス樹脂の相分離状態を固定させる方法と、膜形成時に液晶をマトリックス樹脂から相分離させる方法とがある。

【0004】液晶とマトリックス樹脂の相分離状態を固定させる方法としては、エポキシ樹脂中に液晶を分散させた後に硬化させる方法（特表昭６１－５０２１２８号公報）や、ＵＶ硬化型樹脂中に液晶を分散させた後にＵＶ硬化型樹脂を硬化させる方法（特表昭６２－２２３１号公報）がある。又、膜形成時に液晶をマトリックス樹脂から相分離させる方法としては、マトリックス樹脂の硬化中に液晶を相分離させる方法、溶媒蒸発中に液晶を相分離させる方法、及び熱可塑性樹脂の冷却過程で相分離させる方法（特表昭６３－５０１５１２号公報）等がある。マトリックス樹脂の硬化中に相分離させる方法の改良技術として、液晶とＵＶ硬化樹脂との混合系のＵＶ硬化樹脂の硬化中に液晶を相分離させる方法（特開昭６３－２７１２３３号公報、特開平１－２５２６８９号公報）や、液晶と熱硬化型エポキシ樹脂との混合系の熱硬化型エポキシ樹脂の硬化中に液晶を相分離させる方法（特開昭６３－２８７８２０号公報、特開平１－２９９０２２号公報）等がある。

【0005】又、溶媒蒸発中に液晶を相分離させる方法の改良技術として、活性水酸基を有するアクリル樹脂をマトリックスとして利用するもの（特開平１－２３０６９３号公報）、セルロースアセテートをマトリックスとして利用するもの（特開和６３－１２４０２５号公報）、液晶と相溶性のない樹脂をマトリックスとして利用するもの（特開昭６３－４３９９３号公報）等がある。以上の様な液晶／高分子複合膜を利用するものは、光利用効率の高い明るい液晶表示装置になり、しかも、塗布法を利用して製造することが出来る為に低価格化し得る可能性がある。

【0006】

【発明が解決しようとしている問題点】しかしながら、前述の液晶／高分子複合膜を利用する液晶表示装置は、高分子分散型液晶溶液自体の塗布適性が良くなく、塗布方法によっては優れた性能の液晶／高分子複合膜が得られないという欠点を有する。又、水溶性高分子物質の水溶液と液晶とのエマルジョンを使用する場合には、液晶含有量を８０～９０重量％にして高分子物質を出来るだけ少なくすることによって駆動電圧の低下等の電気光学

特性を向上させており、同時に十分なエマルジョン化を行なう為に２～３倍量の水を使用している。この為にチキソトロピック性が高くなり、塗膜の形成の際に混入した気泡の除去が困難になる。

【０００７】尚、液晶表示装置においては、気泡の存在は致命的な問題であり、特に塗布工程で混入した気泡を除去することは困難である。従って液晶表示装置に要求される電圧特性を全面において均一化することが出来ない。更に、相分離法での液晶／高分子複合膜の製造においても、高分子マトリックスを可能な限り少なくしなければならなく、必然的に塗布液の流動性が高くなり、上記と全く同様な問題が発生する。

【０００８】かくして、液晶／高分子複合膜を形成するに際しては、各種の塗布方法を有効に利用し得ない。例えば、ブレードコーティング法では、塗膜のエッジ、塗り初め、塗り終り等に塗り斑が発生する問題があり、又、パターンコートが不可能で、高価な塗布液を余分に使用する等の問題がある。又、スクリーン印刷法では、メッシュを通過する時点での気泡の発生や、版の裏面に塗布液が裏回りする等の問題が発生する。従って本発明の目的は、上記従来技術の欠点を解決し、液晶／高分子複合膜を形成する際の塗布を容易に行なうことが出来、しかも、気泡の混入のない均一な液晶／高分子複合膜による高分子分散型液晶表示装置を提供することにある。

【０００９】

【問題点を解決する為の手段】上記目的は以下の構成による本発明によって達成される。即ち、本発明は、少なくとも一方が透明な一対の導電性基板間に、液晶／高分子複合膜を挟持してなる高分子分散型液晶表示装置において、上記液晶／高分子複合膜が導電性基板面に形成された隔壁によって区画された複数の区画質内に形成され、且つ上記隔壁が撥水性樹脂からなることを特徴とする高分子分散型液晶表示装置、及びその製造方法である。

【００１０】

【作用】上記本発明によれば、撥水性樹脂からなる隔壁の撥水性により、隔壁による区画室内に塗布される水性の液晶エマルジョン層が、その表面が盛り上がった状態で形成される為に、液晶エマルジョンの乾燥によってエマルジョンの体積が減少したとしても、乾燥後に形成される高分子液晶複合膜の厚さは隔壁の高さとほぼ同一にすることが可能となり、従って対向電極基板を貼りあわせる際、対向電極基板と液晶／高分子複合膜とを電気的に接触させる為に、導電材を対向電極基板と液晶／高分子複合膜との間に塗布する工程を省略することが出来る。

【００１１】又、液晶／高分子複合膜を形成すべき領域の周囲には、撥水性樹脂からなる隔壁が形成されている為、必要な部分のみに高価な液晶エマルジョンを利用することが出来る。更に、液晶エマルジョンの塗布工程が容易である為、高分子材料基板やフイルム基板を導電性基板とする高分子分散型液晶表示装置にすることが出来る。又、複数領域に分割して設けられている液晶／高分子複合膜の領域毎の着色が容易である為、任意の色表示を行なうことが簡単であり、従来のＴＮ型やＳＴＮ型では表現し得なかった反射型カラー表示パネルを安価に供給し得る。

【００１２】

【好ましい実施態様】次に好ましい実施態様を挙げて本発明を更に具体的に説明する。本発明の高分子分散型液晶表示装置の構成の１例を図１に示す。本発明の高分子分散型液晶表示装置１は、電極の作用をする透明導電膜２、２を有し、且つ少なくとも一方が透明な１対のガラス又はフイルム等の基板３、３の間に、無色、着色又は好ましくはＲ（赤）、Ｇ（緑）及びＢ（青）の三原色の色素を含む高分子マトリックス中に液晶が分散保持されている液晶／高分子複合膜５が挟持され、該液晶／高分子複合膜５の領域同士の間隙に、撥水性樹脂からなる隔壁６が形成されている。高分子が着色されている場合には、液晶粒子中にマトリックスに含まれる色素が吸収しない光を吸収する二色性色素が添加されていることが好ましい。又、液晶粒子はカプセル化されていてもよい。

【００１３】この場合の液晶中の二色性色素は、電界による液晶分子の整列に伴って分子方向を変える為、電圧の印加・無印加によって各画素の光吸収特性が変化する。二色性色素の吸収が十分低い状態では、その画素はマトリックス中の色素による色を示し、二色性色素の吸収が十分高い状態では、その画素は二色性色素とマトリックス中の色素との混色によって、例えば、黒色を示す。液晶中の二色性色素がマトリックス層までも着色してしまうことは、表示される画像のコントラストを低下させることになるので、なるべく避けなければならない。この為に液晶粒子はカプセル化されていることが望ましい。液晶中の二色性色素は色度特性の向上、光利用効率の向上、コントラストの向上等という目的の為、各領域の液晶／高分子複合膜毎に異なるものを用いることが出来る。以上の各領域をなす液晶／高分子複合膜は、ストライプ状やモザイク状等の規則的なパターンにより配置され、これらの領域には夫々に対応する電極が設けられ、各画素毎に電圧印加のオン・オフが可能となっている。液晶／高分子複合膜の後方には、拡散反射板が設けられ、十分な明るさを得る為に後方に白色光源を設けてもよい。

【００１４】次に本発明の高分子分散型液晶表示装置の製造方法を、図２による工程図に基づいて説明する。第１工程においては、図２ａに示される様に、一方の基板３における透明導電膜２上に剥離性樹脂層７のパターンを、例えば、スクリーン印刷法によって設ける。このときの剥離性樹脂層７の厚さは、該剥離性樹脂層７同士の間内に形成する後述の撥水性樹脂からなる隔壁６の厚さ

及び液晶エマルジョンを塗布及び乾燥したときの体積減少等を考慮してその高さを適宜決定する。尚、基板3の表面の透明導電膜2は、例えば、ITO膜等であり、基板3としては、ガラス板、石英板、各種の合成樹脂製の板やフイルム等を利用し得る。

【0015】続く第2工程においては、図2bに示される様に、剥離性樹脂層7のパターン同士の間の間隙即ち溝内に、撥水性樹脂液を柔軟な金属や硬質ゴム等によるスキージを利用して充填し、これを硬化させることにより、撥水性樹脂からなる隔壁6を形成する。この撥水性樹脂からなる隔壁6は、例えば、シリコン樹脂や弗素系樹脂で形成される。又、この撥水性樹脂からなる隔壁6を、光不透過性の樹脂で形成したり、或は撥水性樹脂からなる隔壁6中に光不透過性の物質を添加する等して、遮光性の樹脂層とすることにより、色再現性及びコントラストに優れた高分子分散型液晶表示装置が得られる。

【0016】第3工程においては、図2cに示される様に、前述の剥離性樹脂層7をピンセットや粘着テープを利用して剥離し、撥水性樹脂からなる隔壁6とその間の区画室8を形成する。更に、第4工程においては、図2dに示される様に、撥水性樹脂からなる隔壁6による区画室内に、気泡を十分に除去した液晶エマルジョン9を静かに注いだ後、柔軟な金属や硬質ゴム等によるスキージ10を利用して液晶エマルジョン9の表面を平坦化させる。この時隔壁の撥水性と液晶エマルジョンの表面張力との相乗効果によって、液晶エマルジョン層9は中央が盛り上がって形成される。第5工程においては、室温又は液晶エマルジョン9に影響を及ぼすことのない温度で乾燥することにより、図2cに示される様に、液晶エマルジョンとしては体積が減少しているが、液晶／高分子複合膜としては表面の中央部が盛り上がった状態の液晶／高分子複合膜5を得る。

【0017】しかる後の第6工程においては、透明導電膜2を有する他方の導電性基板3を液晶／高分子複合膜5の上に密着させて貼着し、図1に示される構成による高分子分散型液晶表示装置1を得る。本発明の高分子分散型液晶表示装置における撥水性樹脂からなる隔壁の高さは、乾燥後に形成される液晶／高分子複合膜の厚さとほぼ等しくすることが好ましい。液晶／高分子複合膜の形成の際には、得られる液晶／高分子複合膜の塗膜構造、及び液晶・マトリックスへの電圧配分の適正化の点から、マイクロカプセル化した液晶を利用し、これを水溶性樹脂の水溶液中に乳化分散させたエマルジョン塗布液を利用するのが好適である。

【0018】液晶のマイクロカプセル化法は、他の材料に適用されている一般的なマイクロカプセル化技術を使用することが出来る。一般的なマイクロカプセル化法には、化学的作製法、物理化学的作製法及び物理的・機械的作製法がある。化学的作製法については合成反応を用いる界面重合法、in situ重合法、及び高分子物性変化を生じさせる液中硬化被覆法がある。界面重合法は、重縮合或いは重付加反応する様な二種のモノマーとして水溶性のものと油溶性のものを選択し、いずれかを分散させてその界面で反応させる方法である。in situ重合法は、核材の内又は外の一方からリアクタント（モノマー、開始剤）を供給し、カプセル壁膜表面で反応させる方法である。液中硬化被覆法（オリフィス法）は、予め核材を壁膜剤でカプセル化した後、その壁膜を硬化液中で硬化する方法である。

【0019】物理化学的作製法としては、相分離を利用したコアセルベーション法、界面沈殿法（液中濃縮法、液中乾燥法、二次エマルジョン法）及び融解分散法がある。更にコアセルベーション法は、水溶液系でも有機溶媒系でも用いることが出来る。又、溶解性の減少により相分離を生じさせる単純コアセルベーション法、電気的相互作用により相分離を生じさせる複合コアセルベーション法を用いることが出来る。有機溶媒系では溶解性や温度等の変化による相分離現象を利用する。

【0020】界面沈殿法は激しい反応や急激なpH変化等が伴わない、温和な条件でカプセル化可能な方法で、例えば、液晶核材を分散したエマルジョンを疎水性高分子の溶剤溶液中に分散させた後、更に保護コロイド溶液に分散させるものである。融解分散法は壁膜材としてワックスやポリエチレンの様な蝋状物質を用いるもので、加熱下で核材を蝋状物質と共に液中に分散した後冷却する方法である。物理的・機械的作製方法としてスプレー・ドライング法、気中懸濁被覆法、真空蒸着被覆法等が挙げられるが、核材である液晶は常温で液体であり、その大きさを整えるエマルジョンの作製が前提となる為、液晶のカプセル作製法としては適していない。

【0021】

【実施例】次に実施例を挙げて本発明を更に具体的に説明する。

実施例1

ITO付きのガラス板（100mm×100mm×1.1mm）のITO面に、ソルダーマスキング剤（サンノプコ（株）製、TC－580－SN）をスクリーン印刷法によってパターン状に塗布した後、170℃にて10分間加熱して硬化させ、パターン状の剥離性樹脂層を形成した。得られたパターン状の剥離性樹脂層同士の間隙である凹部内に、シリコン樹脂（信越化学工業（株）製、RC－720）をスクリーン印刷用のスキージを用いて充填し、更に電子線を照射して硬化させることにより、撥水性樹脂からなる隔壁を形成した。次いで、パターン状の剥離性樹脂層をピンセットで剥離し、撥水性樹脂からなる隔壁によって区画された区画室を形成した。

【0022】得られた撥水性樹脂からなる区画室内に、ネマチック液晶（メルク社製、E－44）をポリビニルアルコール水溶液に分散させた液晶エマルジョンを、スクリーン印刷用のスキージで充填した後、ドライヤーで

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乾燥し、液晶／高分子複合膜を形成した。しかる後に、前記液晶／高分子複合膜の上に他方の導電性基板をなすＩＴＯ付きのガラス板のＩＴＯ面を密着させて貼着することにより、目的の高分子分散型液晶表示装置を得た。得られた液晶表示装置は、電圧を印加しなければ、白色不透明であったが、電圧を印加すると無色透明になった。

【００２３】実施例２

ＩＴＯ付きのガラス板（１００mm×１００mm×１．１mm）のＩＴＯ面に、ソルダーマスキング剤（サンノプコ（株）製、ＴＣ－５８０－ＳＮ）をスクリーン印刷法によってパターン状に塗布した後、１７０℃にて１０分間加熱して硬化させ、パターン状の剥離性樹脂層を形成した。得られたパターン状の剥離性樹脂層同士の間隙である凹部内に、シリコン樹脂（信越化学工業（株）製、ＲＣ－７２０）をスクリーン印刷用のスキージを用いて充填し、更に電子線を照射して硬化させることにより、撥水性樹脂からなる隔壁を形成した。次いで、パターン状の剥離性樹脂層をピンセットで剥離し、撥水性樹脂からなる隔壁によって区画された区画室を形成した。

【００２４】得られた撥水性樹脂からなる区画室内に、二色性色素（（株）日本感光色素研究所製、Ｇ－２６４）を溶解させたネマチック液晶（メルク社製、Ｅ－４４）をポリビニルアルコール水溶液に分散させた液晶エマルジョンを、スクリーン印刷用のスキージで充填した後、ドライヤーで乾燥し、液晶／高分子複合膜を形成した。しかる後に、前記液晶／高分子複合膜の上に他方の導電性基板をなすＩＴＯ付きのガラス板のＩＴＯ面を密着させて貼着することにより、目的の高分子分散型液晶表示装置を得た。得られた液晶表示装置は、電圧を印加しなければ、青色不透明であるが、電圧を印加すると無色透明になった。

【００２５】実施例３

ＩＴＯ付きのガラス板（１００mm×１００mm×１．１mm）のＩＴＯ面に、ソルダーマスキング剤（サンノプコ（株）製、ＴＣ－５８０－ＳＮ）をスクリーン印刷法によってパターン状に塗布した後、１７０℃にて１０分間加熱して硬化させ、パターン状の剥離性樹脂層を形成した。得られたパターン状の剥離性樹脂層同士の間隙である凹部内に、シリコン樹脂（信越化学工業（株）製、ＲＣ－７２０）をスクリーン印刷用のスキージを用いて充填し、更に電子線を照射して硬化させることにより、撥水性樹脂からなる隔壁を形成した。次いで、パターン状の剥離性樹脂層をピンセットで剥離し、撥水性樹脂からなる隔壁によって区画された区画室を形成した。

【００２６】得られた撥水性樹脂からなる区画室内に、二色性色素（Ｍ－１３７、三井東圧染料（株）製）を溶解させたネマチック液晶（メルク社製、Ｅ－４４）をポリビニルアルコール水溶液に分散させた液晶エマルジョンを、メタルマスクを重ねた上から注ぎ、スクリーン印

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刷用のスキージで充填した後、ドライヤーで乾燥し、液晶／高分子複合膜を形成した。同様に二色性色素（Ｍ－４２１、三井東圧染料（株）製）を溶解させたエマルジョンを、別のパターンのメタルマスクの上から同様にコーティングした。乾燥後、更に二色性色素（ＳＩ－４２６、三井東圧染料（株）製）を溶解させたエマルジョンを別のパターンのメタルマスクの上から同様にコーティングした。その後室温で一昼夜乾燥させた。

【００２７】しかる後に、前記液晶／高分子複合膜の上に他方の導電性基板をなすＩＴＯ付きのガラス板のＩＴＯ面を密着させて貼着することにより、目的の高分子分散型液晶表示装置を得た。得られた液晶表示装置は、電圧を印加しなければ、パターン毎に赤、青及び緑に着色された不透明な状態であったが、電圧を印加すると無色透明な状態になった。又、パターン毎に電圧の印加・無印加を選択すると、様々な色模様のパターンが表示できた。

【００２８】実施例４

ＩＴＯを蒸着したＰＥＴフイルムのＩＴＯ面に、ソルダーマスキング剤（サンノプコ（株）製、ＴＣ－５８０－ＳＮ）をスクリーン印刷法によってパターン状に塗布した後、１２０℃にて６０分間加熱して硬化させ、パターン状の剥離性樹脂層を形成した。得られたパターン状の剥離性樹脂層同士の間隙である凹部内に、シリコン樹脂（信越化学工業（株）製、ＲＣ－７２０）をスクリーン印刷用のスキージを用いて充填し、更に電子線を照射して硬化させることにより、撥水性樹脂からなる隔壁を形成した。次いで、パターン状の剥離性樹脂層をピンセットで剥離し、撥水性樹脂からなる隔壁によって区画された区画室を形成した。

【００２９】得られた撥水性樹脂からなる区画室内に、ネマチック液晶（メルク社製、Ｅ－４４）をポリビニルアルコール水溶液に分散させた液晶エマルジョンを、スクリーン印刷用のスキージで充填した後、ドライヤーで乾燥し、液晶／高分子複合膜を形成した。しかる後に、前記液晶／高分子複合膜の上に他方の導電性基板をなすＩＴＯを蒸着したＰＥＴフイルムのＩＴＯ面を密着させて貼着することにより、目的の高分子分散型液晶表示装置を得た。得られた液晶表示装置は、電圧を印加しなければ、白色不透明であったが、電圧を印加すると無色透明になった。又、導電性基板が両方ともフイルムである為に、装置全体を曲げることが出来、カマボコ型や円筒状にしても表示が可能であった。

【００３０】

【発明の効果】上記本発明によれば、簡単な文字やパターン表示を行なうスタティック型表示装置は勿論のこと、パソコンやワープロの表示装置、その他の大容量の単色又はカラーのアクティブマトリックス型の表示装置の様な高精度を必要とする表示装置にも適用出来、且つ大面積の表示装置のものも製造可能であり、広範囲な分

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野に利用し得る。

【００３１】

【図面の簡単な説明】

【図１】本発明の高分子分散型液晶表示装置を説明する図。

【図２】本発明の高分子分散型液晶表示装置の製造工程を説明する図。

【符号の説明】

１　高分子分散型液晶表示装置

２　透明導電膜

３　基板

４　液晶

５　液晶／高分子複合膜

６　撥水性樹脂からなる隔壁

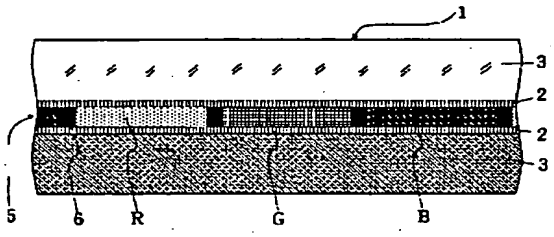
７　剥離性樹脂層

８　撥水性樹脂の隔壁からなる区画室

９　液晶エマルジョン

１０　スキージ

【図１】



【図２】